Arizona
Department of
Education

Mathematics Standards Chart for AIMS

Standards 1 through 6

Essentials Level (Grade 8)
Reflecting the Blueprint of 08.26.96

STANDARD 1: NUMBER SENSE

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    Students develop number sense and use numbers and number relationships to acquire basic facts, to solve a wide variety of real-world problems, and to determine the reasonableness of results.
    Students know and are able to do all the Readiness, Foundations and Essentials (Grade 5) PO's, and the following:
	Number of Questions	

CONCEPT/Performance Objective	**MC**	**SA**
	6	0
1M-E1. Read, write and order integers, whole numbers and rational numbers	**2**	**0**
PO 1. Compare and order using concrete or illustrated models **D.** rational numbers (e.g., –5, 1.2, 1¾, square root of 16)		
PO 2. Represent place value using concrete or illustrated models **B.** rational numbers (millions to millionths)		
PO 3. Read and write whole numbers, integers, common fractions and decimals using real-world situations **B.** rational numbers (millions to millionths)		
1M-E2. Relate the basic arithmetic operations to one another (e.g., multiplication and division are inverse operations)	**0**	**0**
PO 1. Represent the process of multiplication as repeated addition using concrete or illustrative models **B.** fractions and decimals		
PO 2. Represent the process of division as repeated subtraction, partitioning a group and partitioning a whole using **concrete or illustrative models** **B.** fractions and decimals		
PO 3. Write the family of equations using inverse operations for a given set of numbers **B.** positive fractions and decimals, integers with addition/subtraction and multiplication/division		

<u>Note</u>: The numbering and lettering scheme is discontinuous because the Arizona Academic Standards use the same scheme to include both grade 5 and grade 8, and the present document represents only the objectives tested at grade 5 and the concepts that include them.

STANDARD 1, continued		
CONCEPT/Performance Objective	**MC**	**SA**
1M-E3. Demonstrate proficiency with the operations of multiplication and division of whole numbers	**2**	**0**
PO 1. Calculate multiplication/division 　　　E. two-digit divisor, with remainders and rounding in context (e.g., percentages and money)		
PO 2. Calculate multiplication and division problems using contextual situations		
1M-E4. Develop and apply number theory concepts (e.g., primes, factors and multiples) to represent numbers in various ways	**1**	**0**
PO 2. Factor a whole number into a product of its primes (prime factorization)		
PO 3. Identify greatest common factor and least common multiples for a set of whole numbers		
PO 4. Sort numbers by their properties 　　　B. prime, composite, square, square root		
PO 5. Simplify numerical expressions using order of operations		
1M-E5. Represent and use numbers in equivalent forms (integers, fractions, percent, decimals, exponents, scientific notation and square roots)	**0**	**0**
PO 1. Add, subtract, multiply and divide integers, positive fractions and decimals		
PO 2. Demonstrate the relationship and equivalency among 　　　B. decimals, fractions, ratios, percents		
PO 3. Factor numbers into prime form and express in exponential form		
PO 4. Convert standard notation to scientific notation and vice versa with positive exponents		
PO 5. Determine the square root of a perfect square.		
1M-E6. Recognize that the degree of precision needed in calculating a number depends on how the results will be used and the instruments used to generate the measurements	**1**	**0**
PO 1. Express answers to the appropriate place or degree of precision (e.g., time, money, *pi*)		
PO 2. Apply the appropriate strategy (e.g., estimation, approximation, rounding or exact numbers) when calculating to solve problems		
PO 3. Demonstrate/describe the magnitude of 　　　B) rational numbers (e.g., "How small is a bacterium?")		
PO 4. Interpret calculations and calculator results within a contextual situation **NOTE:** This is to be assessed at the district level.		

STANDARD 2: DATA ANALYSIS AND PROBABILITY

STANDARD 2: DATA ANALYSIS AND PROBABILITY
        Students use data collection and analysis, statistics, and probability to make valid inferences, decisions and arguments and to solve a variety of real-world problems.
        Students know and are able to do all the Readiness, Foundations and Essentials (Grade 5) PO',s and the following:
	Number of Questions	

	6	1
CONCEPT/Performance Objective	MC	SA
2M-E1. Construct, read, analyze and interpret tables, charts, graphs and data plots (e.g., box-and-whisker, stem-and-leaf, and scatter plots	1	0
PO 1. Construct B) histograms, stem-and-leaf plots, scatter plots, circle graphs and flow charts		
PO 2. Interpret and analyze data from graphical representations and draw simple conclusions: B. histograms, stem-and-leaf plots, scatter plots, circle graphs and flow charts		
PO 3. Choose an appropriate graphical format to organize and represent data		
2M-E2. Make valid inferences, predictions and arguments based on statistical analysis	2	0
PO 1. Formulate predictions from a given set of data and justify predictions		
PO 2. Compare a given prediction with the results of an investigation		
PO 3. Critique the conclusions and recommendations of others' statistics		
PO 4. Consider the effects of missing or incorrect information		
2M-E3. Display and use measures of range and central tendency (i.e., mean, median, and mode	2	0
PO 2. Find the mean, median, mode and range of a data set		
PO 3. Choose appropriate measures of central tendencies to describe given or derived data		
2M-E4. Use counting strategies to determine all the possible outcomes of a particular event (e.g., the number of ways students can line up to have their picture taken)	0	1
PO 1. Find all possible outcome sets involving B. two or more sets of objects		
PO 2. Find all possible arrangements given a set (e.g., "How many ways can you arrange a set of books on a shelf?")		
2M-E5. Determine probabilities through experiments and/or simulations and compare the results with the mathematical expectation	1	0
PO 1. Make predictions from the results of a student-generated experiment (empirical probability) B. two-stage events (e.g., two spinners)		
PO 2. Determine and compare experimental (empirical) and mathematical (theoretical) probabilities (e.g., flipping two-colored counters)		
PO 4. Express probability as a fraction, zero or one		

STANDARD 3: PATTERNS, ALGEBRA AND FUNCTIONS

STANDARD 3: PATTERNS, ALGEBRA AND FUNCTIONS Students use algebraic methods to explore, model and describe patterns, relationships and functions involving numbers, shapes, data and graphs within a variety of real-world problem-solving situations.	Number of Questions	
Students know and are able to do all the Readiness, Foundations and Essentials (Grade 5) PO's, and the following:	10	1
CONCEPT/Performance Objective	MC	SA
3M-E1. Use algebraic methods (write number sentences in the form of expressions and equations) to explore, model and describe patterns and functions involving numbers, shapes, data, graphs and data plots	2	0
PO 4. Generate patterns using algebraic expressions		
3M-E2. Describe, represent and analyze patterns and relationships using shapes, tables, graphs, data plots, verbal rules and standard algebraic notation	1	0
This is covered in 3ME1-PO1, PO2, PO3, PO4; and 3ME4-PO1, PO2, PO3, PO4		
3M-E3. Describe the concepts of variables, expressions, equations and inequalities	2	0
PO 1. Describe and use variables in a contextual situation		
PO 2. Evaluate an expression using substitution with four basic operations on whole numbers		
PO 3. Translate a written phrase to an algebraic expression and vice versa (words to symbols and symbols to words) (e.g., the quotient of x and y)		
PO 4. Express a simple inequality from a contextual situation (e.g., Joe earns more than $5.00 an hour; therefore, $x > 5$)		
3M-E4. Analyze functional relationships to explain how a change in one variable results in a change in another	2	0
PO 2. Produce the rule (function that explains the relationship (pattern) between the numbers when a change in the first variable affects the second variable (T-chart, two-row table, or input/output machine)		
PO 4. Complete a T-chart for a given rule		
3M-E5. Use patterns and functions to represent and solve problems both formally and informally (e.g., measuring the height a ball bounces by dropping different balls from different starting heights	0	1
PO 1. Solve a problem given a pattern both formally and informally (e.g., "In a patterned necklace, how many red and green beads do you need for a 20-inch necklace?")		
3M-E6. Distinguish between linear and nonlinear functions through investigations	1	0
PO 1. Distinguish between linear and nonlinear functions, given graphic examples		

STANDARD 3, continued		
CONCEPT/Performance Objective	**MC**	**SA**
3M-E7. Solve simple linear equations and inequalities using a variety of methods (e.g., informal, formal, graphical, and a variety of manipulatives	**3**	**0**
PO 1. Solve equations using B. whole numbers with one variable-multiple steps		
PO 2. Solve linear (first degree) equations using models/manipulatives, symbols and/or graphing in a one-step equation		
PO 3. Graph given data points to represent a linear equation B. in (*x, y*) form using all four quadrants of a coordinate grid		
3M-E8. Develop, analyze, and explain methods for solving proportions	**1**	**0**
PO 1. Describe how to solve a problem in context using a proportion		
PO 2. Compare quantities using ratios		
PO 3. Solve proportions using formal (e.g., cross product) or informal (e.g., diagrams, geometric models) methods		

STANDARD 4: GEOMETRY

STANDARD 4: GEOMETRY Students use geometric methods, properties and relationships as a means to recognize, draw, describe, connect, and analyze shapes and representations in the physical world. ***Students know and are able to do all the Readiness, Foundations and Essentials (Grade 5) PO's, and the following:***	Number of Questions	
	5	2
CONCEPT/Performance Objective	**MC**	**SA**
4M-E1. Visualize and draw two- and three-dimensional geometric figures with special attention to analyzing and reasoning informally about their properties (e.g., parallelism, perpendicularity and congruence)	**1**	**0**
PO 1. Classify two-dimensional shapes and three-dimensional figures by their configuration B. by properties		
PO 2. Identify the properties of geometric figures using appropriate terminology and vocabulary (e.g., parallelism, perpendicularity and congruency) B. three-dimensional figures (prisms)		
PO 3. Draw or build… B. three-dimensional figures by applying significant properties of each (e.g., draw a rectangle with two sets of parallel sides and four right angles)		

STANDARD 4, continued		
CONCEPT/Performance Objective	**MC**	**SA**
4M-E2. Apply geometric properties and relationships such as congruence, similarity, angle measure, parallelism and perpendicularity to real-world situations	**4**	**0**
PO 1. Design or draw a model (e.g., designing a playhouse, garden) that demonstrates basic geometric relationships, such as B [parallelism, perpendicularity, similarity] and proportionality and congruency		
PO 3. Label corresponding, supplementary and complementary angles		
PO 4. Measure and label specified angles (e.g., alternate interior, obtuse, acute, right, corresponding…)		
4M-E3. Perform elementary transformations (e.g., tessellations, flips, and slides)	**0**	**1**
PO 2. Illustrate, using concrete or pictorial models, B. reflections and translations (e.g., tessellations)		
PO 3. Draw or build a shape that B. has two or more lines of symmetry		
4M-E4. Represent and solve problems relating to size, shape, area and volume using geometric models	**0**	**1**

PO 1. Solve problems using **given** formulas for
  B. area, perimeter/circumference of various circles/polygons
  C. volume of prisms		

PO 3. Draw or build a variety of shapes having the same perimeter and area		

STANDARD 5: MEASUREMENT AND DISCRETE MATHEMATICS

STANDARD 5: MEASUREMENT AND DISCRETE MATHEMATICS
    Students make and use direct and indirect measurement, metric and U.S. customary, to describe and compare the real world and to prepare for the study of discrete functions, fractals and chaos which have evolved out of the age of technology.
    Students know and are able to do all the Readiness, Foundations and Essentials (Grade 5) PO's, and the following:
	Number of Questions	

	4	**1**
CONCEPT/Performance Objective	**MC**	**SA**
5M-E1. Estimate, make and use measurements (U.S. customary and metric) to describe and make comparisons	**0**	**0**
PO 3 Estimate measurements for both U.S. customary and metric units within either system		
PO 4 Compare estimated measurements **between** U.S. customary and metric systems (e.g., a yard is about a meter)		

STANDARD 5, continued		
CONCEPT/Performance Objective	**MC**	**SA**
5M-E2. Select and use appropriate units and tools to measure to the degree of accuracy required in a particular problem-solving situation	**1**	**0**
PO 3. Measure to the appropriate degree of accuracy to solve problems (e.g., measuring to the nearest $\frac{1}{16}$ -inch or nearest $\frac{1}{2}$ -inch; measuring to the nearest ounce or nearest pound; measuring to the nearest millimeter or nearest liter)		
5M-E3. Estimate, use and describe measures of distance, perimeter, area, volume, capacity, weight, mass and angles	**1**	**0**

PO 2. Record estimates and measurements for
    B. distance in scale drawings   H. mass
    D. circumference   I. degrees of angles
    E. area   J. capacity
    F. volume		

PO 3. Compare weight to mass and capacity to volume		
5M-E4. Develop and use formulas and procedures to solve problems involving measurement	**1**	**1**

PO 1. Develop a procedure or formula to calculate
    B. area of polygons and circles
    C. surface area of rectangular prisms
    D. volume of rectangular prisms		

PO 2. Use given formulas to find
    B. circumference of a circle
    C. area of polygons and circles
    D. surface area of rectangular prisms
    E. volume of prisms		

5M-E5. Describe how a change in the linear dimension of an object affects its perimeter, area and volume	**1**	**0**
PO 2. Describe the effect on perimeter, area and volume when one dimension of an object is altered		
5M-E6. Use calculators and computers to perform basic recursive and iterative processes	**0**	**0**
PO 1. Solve a problem using the iterative process B. designing a simple geometric pattern (e.g., design a basic quilt block; use it to generate the whole quilt)		
PO 3. Complete the iterative sequence (e.g., given these terms and assuming a constant difference 21, -, -, -, -, -, 63, -, -, -!)		
PO 4. Generate subsequent terms of a recursive sequence (e.g., 3, 3, 6, 9, 15,…)		

STANDARD 6: MATHEMATICAL STRUCTURE/LOGIC

STANDARD 6: MATHEMATICAL STRUCTURE/LOGIC Students use both inductive and deductive reasoning as they make conjectures and test the validity of arguments	Number of Questions	
Students know and are able to do all the Readiness, Foundations and Essentials (Grade 5) PO's, and the following:	4	1
CONCEPT/Performance Objective	MC	SA
6M-E1. Use models to explain how ratios, proportions and percents can be used to solve problems and apply reasoning processes, such as spatial reasoning and reasoning with proportions and graphs	2	0
PO 1. Communicate how to solve problems involving ratios, proportions and percents using concrete and illustrative models		
6M-E2. Construct, use and explain algorithmic procedures for computing and estimating with whole numbers, fractions, decimals and integers	0	1
PO 1. Design a method with a series of defined steps for solving a problem; justify the method B. fractions, decimals and integers		
6M-E3. Use _if…then_ statements to construct simple valid arguments	2	0

PO 1. Construct simple valid arguments using if…then statements based on
    B. geometric shapes
    C. proportional reasoning in probability
    D. syllogism		

PO 2. Solve problems using deductive reasoning		

TOTAL NUMBER OF AIMS ESSENTIALS (GRADE 8) MATHEMATICS QUESTIONS	35	5
	MC	SA
TOTAL AIMS ESSENTIALS (GRADE 8) MATHEMATICS POINTS	35	10